# CANDIDATE AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Notropis oxyrhynchus* Hubbs and Bonham

COMMON NAME: sharpnose shiner

LEAD REGION: 2

INFORMATION CURRENT AS OF: March 5, 2002

STATUS/ACTION (Check all that apply):
_X_ New candidate
___ Continuing candidate
    ___ Non-petitioned
    ___ Petitioned - Date petition received: _____
        ___ 90-day positive - FR date: _____
        ___ 12-month warranted but precluded - FR date: _____
_____ Is the petition requesting a reclassification of a listed species?
    ___ Listing priority change
        Former LP: ___
        New LP: ___
Latest Date species first became a Candidate: _____
___ Candidate removal: Former LP: ___ (Check only one reason)
    ___ A - Taxon more abundant or widespread than previously believed or not subject to a degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
    ___ F - Range is no longer a U.S. territory.
    ___ M - Taxon mistakenly included in past notice of review.
    ___ N - Taxon may not meet the Act's definition of "species."
    ___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Fish: Cyprinidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Texas

CURRENT STATES/ COUNTIES (optional)/TERRITORIES/COUNTRIES OF OCCURRENCE:
Texas

LEAD REGION CONTACT (Name, phone number): Susan Jacobsen, (505) 248-6641

LEAD FIELD OFFICE CONTACT (Office, name, phone number):

Arlington Field Office, Omar Bocanegra, (817) 277-1100

BIOLOGICAL INFORMATION (Describe habitat, historic vs. current range, historic vs. current population estimates (# populations, #individuals/population), etc.):

## Description

The sharpnose shiner (*Notropis oxyrhynchus*) is a small, slender minnow, endemic to the Brazos River Basin in Texas (Hubbs et al., 1991). Adult sharpnose shiners are approximately 30 to 50 millimeters (1.2 to 2.0 inches (in)) in standard length, have a strongly curved ventral contour, oblique mouth, and pointed snout (Hubbs and Bonham, 1951). They are silver in color, with a faint lateral stripe extending from the gills to the tail. The anal fin is slightly falcate and usually has no more than nine rays; the dorsal fin has eight rays and begins behind the insertion of the pelvic fin (Hubbs and Bonham, 1951). This species was first collected from the Brazos River in 1938, but was not described until 1951 by Hubbs and Bonham, who speculated that its closest relative was *N. percobromus* (= *atherinoides*), which occurs in the Red River system to the north of the Brazos River drainage and in systems to the east (Gilbert, 1980).

## Habitat

Sharpnose shiners are obligate riverine fish that occur in fairly shallow water (38 to 82 centimeters (15 to 32 in) in depth) in broad, open sandy channels with moderate current (Moss and Mayes, 1993). Ostrand (2000) found abiotic factors associated with sharpnose shiner habitat to include specific conductance < 30 mS, relatively high current velocity (> 0.20 m/s)(0.65 feet/s) and high turbidity (> 41 NTU). They generally feed on aquatic invertebrates dominated by dipterans, ostracods, trichopterans, odonata, coleopterans, hemipterans, and various terrestrial arthropods (Marks et al., 2001). They often consume a large amount of sand/silt, which would indicate foraging behavior occurs among the sediment, as well as on drift in the water column (Marks et al., 2001). Very little is known about the life history of this species, though it is assumed to be similar to that of congeners (belonging to the same genus) that inhabit prairie streams such as *N. girardi* (a federally threatened species), *N. bairdi*, and *N. buccula,* which are thought to spawn primarily during flood events (Moore, 1944; Moss and Mayes, 1993).

The Brazos River watershed extends from eastern New Mexico southeasterly to the Gulf of Mexico. The basin is approximately 1,030 kilometers (km)( 640 miles(mi)) in length, encompasses approximately 118,103 square km (45,600 square mi) (Dunn and Raines, 2001), ranges in width from 1.6 to 193 km (1.0 to 120 mi), and drains all or portions of 69 counties in Texas (Cronin et al., 1973) and three counties in New Mexico. The predominant land use within the basin is agriculture, dominated by cotton, corn, and sorghum, and open rangeland (Dunn and Raines, 2001). Within the Middle Brazos River Basin, a large percentage of agriculture consists of concentrated animal feeding operations (CAFOs) (Armstrong, 1998).

The Brazos River is a typical prairie stream. The main stem originates in the upper reach from the confluence of the Salt and Double Mountain Forks. The upper region of the watershed is highly variable with regard to flow and often becomes intermittent, forming isolated pools within the channel (Echelle et al., 1972; Ostrand, 2000; Ostrand and Wilde, 2001). The river traverses through the Edwards Plateau Ecosystem and extends southeastward through the East Texas and Texas Gulf Coast Ecosystems (U.S. Fish and Wildlife Service, 1994).

Since the early 1900s, significant reservoir construction has occurred within the Brazos River

Basin. By 1986, 1,165 minor and 13 major reservoirs, three of which occur on the main stem of the Brazos River, were listed in the Texas Natural Resource Conservation Commission's (TNRCC) dam inventory (Dunn and Raines, 2001). From 1941 to 1969, the rate of reservoir construction increased substantially and included Possum Kingdom Reservoir in 1941, Whitney Reservoir in 1951, and Granbury Reservoir in 1969, which are located on the main stem Brazos River, as well as six other major reservoirs within the watershed (Dunn and Raines, 2001). A new reservoir, Alan Henry Reservoir, impounded the Double Mountain Fork of the Brazos River in October 1993 (Wilde and Ostrand, 1999), to serve as a future water supply for the City of Lubbock (Llano Estacado Water Planning Group, 2001). The effects of reservoir construction in the Brazos River Basin since 1953 have resulted in significant temporal changes in its fish assemblage (Anderson et al., 1995; Hubbs et al. 1997; Wilde and Ostrand, 1999).

Historic Distribution

The sharpnose shiner historically occurred throughout the Brazos River system, including the Double Mountain and Salt Forks of the Upper Brazos River drainage, and has also been documented in the South and North Forks of the Wichita River within the Red River Basin (see Moss and Mayes, 1993). Hubbs and Bonham's (1951) description of the sharpnose shiner (82 specimens collected) reported the fish at four sites on the main stem Brazos River (Brazos County), as well as in its tributaries the Navasota River and Little Brazos River in Brazos County between 1938 and 1941. An additional collection was made on the Brazos downstream from Towash Creek (Hill/Bosque Counties) in 1940. An introduced population may exist in the Colorado River above Buchanan Reservoir (Hubbs et al., 1991); however, the validity of this population is still in question (e.g., Moss and Mayes, 1993).

A biological study of the Upper Brazos drainage conducted in 1979 for the purposes of analyzing effects of the proposed Brazos River Natural Chloride Control Project estimated a population of 1,611 sharpnose shiners in the Salt Fork of the Brazos River, and a population estimated at 451 individuals from Croton Creek, a tributary of the Salt Fork (Johnson et al., 1982).

Moss and Mayes (1993) conducted an extensive study of the distribution of the sharpnose shiner and smalleye shiner (*N. buccula*) within the Brazos River system. The study included a review of known museum, university, and other collections (from 1951 to 1986) to determine the historical distribution of both species. Their review indicated the sharpnose shiner historically occurred at 15 main stem sites (not including sites from the original description), three sites on the Double Mountain Fork of the Brazos River, nine sites on the Salt Fork of the Brazos River, and two sites on the Wichita River (from 1953 and 1955), which drains into the Red River Basin. The historical collections included specimens from the Upper, Middle, and Lower Brazos River systems (Texas Parks and Wildlife Department, 1996), ranging from the upper reaches on the Double Mountain and Salt Forks in Kent County, Texas, to the southernmost site in Fort Bend County, Texas.

Of the historical records of sharpnose shiners from the Brazos River Basin examined by Moss and Mayes (1993), 18 collections were taken from the Upper Brazos River drainage, the majority of which were located on the Double Mountain and Salt Forks of the Brazos River. The Double

Mountain Fork samples (one sample from 1951 and three from 1986) consisted of 177 specimens from sites in Kent, Fisher, and Haskell Counties. The Salt Fork collections (two samples from 1951, one from 1953, one from 1984, and six from 1986) contained 1,181 specimens from locations in Kent, Knox, Baylor, and Young Counties. Main stem records from the Upper Brazos included 24 specimens collected from two sites in Young County in 1951 and 1986, and 67 specimens collected from two sites in Palo Pinto County from 1951 to1952.

The remaining 15 historic records include four collections of 90 specimens collected between 1951 and 1953 from the Middle Brazos River (Somervell, Bosque, and McLennan Counties), and 11 records collected from the Lower Brazos River. The Lower Brazos River collections include 947 specimens collected between 1951 and 1967 from six sites in Brazos, Burleson, Grimes, Waller, and Fort Bend Counties and 268 specimens collected between 1970 and 1986 from five sites in Robertson, Brazos, Waller, and Washington Counties.

Current Distribution

Moss and Mayes' (1993) assessment of the declining distribution of the sharpnose shiner within the Brazos River Basin was based on the historical records compared with their sampling of the basin from October 1988 through August 1991. Sampling sites were selected based on all known localities of the smalleye shiner within the basin (37 sites), most of which (26 sites) were located in the Upper Brazos River Basin, including 24 sites upstream of Possum Kingdom Reservoir. From these upstream samples, a total of 2,056 sharpnose shiners were collected from seven sites on the Salt Fork (Stonewall, Knox, Baylor, and Young Counties), three sites on the Double Mountain Fork (Kent, Fisher, and Stonewall Counties), and three sites on the North Fork Double Mountain Fork (Garza County). Two sites sampled in the main stem Upper Brazos below Possum Kingdom Reservoir in Palo Pinto County did not include sharpnose shiners.

Additional surveys within the Upper Brazos drainage that failed to collect sharpnose shiner include collections from Croton Creek (Kent County), which drains into the Salt Fork of the Brazos River, and two sites on the Clear Fork of the Brazos River (Shackelford and Fisher Counties). The sharpnose shiner historically occurred in Croton Creek, but has apparently never been documented from the Clear Fork.

The remaining 11 sampling sites were located within the Middle (Parker and Falls Counties) and Lower Brazos River Basin (Milam, Brazos, Washington, Austin, Fort Bend, and Bell Counties). These sampling efforts produced only 27 specimens from six sites within the Lower Brazos River. Sampling was also conducted within the Red River Basin on the Wichita River (Baylor and Wichita Counties), North Wichita River (Knox County), and South Wichita River (Knox County), but no shiners were collected. The sharpnose shiner has not been collected from the Wichita River drainage since the 1950s (Moss and Mayes, 1993).

Current information on the status of the sharpnose shiner continues to show a drastic contrast between the Upper Brazos (upstream of Possum Kingdom Reservoir) and Middle/Lower Brazos River. Extensive sampling at thirteen sites within the Upper Brazos by Ostrand (2000) in 1997 and 1998, produced 2,791 sharpnose shiners at 10 sites (Garza, Kent, Fisher, Stonewall, and

Knox Counties), where they represented one of the seven dominant species. The population of sharpnose shiners upstream from Possum Kingdom Reservoir is estimated to represent 8% of the fish assemblage (Ostrand, 2000).

Downstream of Possum Kingdom Reservoir, the population of sharpnose shiners has apparently declined to a fraction of the historic abundance. Since Moss and Mayes' (1993) survey of the Middle and Lower Brazos River system which produced only 27 specimens, limited research has been conducted in this region. Sampling efforts in 1994 reported two sharpnose shiner specimens from the lower Brazos River in Robertson/Milam Counties (Texas Parks and Wildlife Department, 1996); however, this study did not produce any other sharpnose shiners within the river.

In the mid 1990s, collecting efforts at a single site on the lower Brazos River (Burleson/Brazos Counties) yielded four specimens from two sampling dates in 1993, one specimen from four sampling dates in 1994, and six specimens from three sampling dates in 1995 (Winemiller, unpublished). The specimens collected at this site in 1995 are apparently the last known records of the sharpnose shiner downstream of Possum Kingdom Reservoir.

Winemiller and Gelwick (1999) sampled 26 sites within the Middle (McLennan and Falls) and Lower (Milam, Robertson, Brazos, Burleson, Washington, Waller, Austin, Fort Bend, Grimes, and Limestone Counties) Brazos River drainages between September and October 1998, including six main stem sites, three sites on the Navasota River, and one site on the Little Brazos River. These collecting efforts produced 53 species of fish; however, no sharpnose shiners were collected. Most recently, a survey was conducted specifically for sharpnose shiner in the Middle (Falls County) and Lower Brazos River (Austin, Brazos, Fort Bend, and Robertson Counties) in 2000 and 2001. The results of the survey indicated that no sharpnose shiners were present within this portion of their historical range (Wilde and Bonner, unpublished).

Historically, the sharpnose shiner existed throughout the Brazos River and several of its major tributaries within the watershed. Current information indicates that the population within the Upper Brazos River drainage (upstream of Possum Kingdom Reservoir) is apparently stable, while the population within the Middle and Lower Brazos River Basins may only exist in remnant areas of suitable habitat, or may be completely extirpated, representing a reduction of approximately 64% of its historical range.

THREATS (Describe threats in terms of the five factors in section 4 of the ESA providing specific, substantive information. **If this is a removal of a species from candidate status or a change in listing priority, explain reasons for change**):

A. <u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>.

The most significant threat to the existence of the sharpnose shiner is the present and continued modification of its habitat attributable to anthropogenic factors. These factors include reservoir

construction, irrigation and water diversion, sedimentation, industrial and municipal discharges, and agricultural activities.

Reservoirs

River impoundments often adversely affect downstream fisheries by altering temperature regimes, flow rates, substrate, water quality, and nutrient availability (Anderson et al., 1983). The downstream effects of impoundments often create a benign habitat within the channel, restricting its use to those species that proliferate in deep, incised channels. The significant changes to fish assemblages, including the local extinction of species, produced by downstream effects have been well documented (Gore and Bryant, 1986; Anderson et al., 1983). Reservoirs also fragment riverine habitat prohibiting the completion of the life cycle for those species that require an unimpeded stream for spawning and/or migration.

The downstream effects of reservoirs have altered the habitat within the Brazos River, impacting the fish assemblage. The Morris Sheppard Dam, which impounds Possum Kingdom Reservoir, incorporates hydroelectric generators, which utilize stored water through releases from the dam dependent on pool elevation and local power needs. These hypolimnial releases have modified the thermal regime up to 120 kilometers downstream and along with the associated chemical modifications, are likely responsible for the extirpation of at least four species of fish in the downstream reach (Anderson et al., 1983). In addition to the thermal and chemical alterations affecting fish assemblages, flow regime regulated by dams restricts habitat availability for many fish species (Bain et al., 1988). The marked decrease in fish diversity and decrease in abundance of cyprinids documented within the Brazos River Basin are also likely due to habitat modifications such as reservoir construction (Anderson et al., 1995).

Changes in channel morphology and substrate have also taken place within the Brazos River due to major impoundments. Restriction of natural stream flow and sediment transport often contributes to channel incision and widening. The transport of sand through the Brazos River system has decreased in part due to reservoirs (Mathewson and Minter, 1981; Dunn and Raines, 2001). Mathewson and Minter (1981) suggested that the major reservoirs trap approximately 76% of all sand produced within the Brazos River Basin.

Collections made by Moss and Mayes (1993) revealed a distinct difference between the fish assemblage upstream and downstream from Possum Kingdom Reservoir. They suggested that the effects of reservoir construction on the downstream channel have modified the habitat, excluding many native prairie minnows while generalist cyprinids have prospered. Anderson et al. (1983) noted the change created by the construction of the reservoir from sandy bottom and high turbidity (typical sharpnose shiner habitat) to clear, gravel bottom habitat for a distance of 30 km (19 mi) downstream from the Morris Sheppard Dam. Within this reach, seven species not normally found in the non-impacted reaches of the Brazos River (i.e., upstream from the reservoir), including two exotic species, had invaded the modified channel (Anderson et al., 1983).

In addition to the impacts Possum Kingdom Reservoir has created within the Brazos River, two

other impoundments occur on the main stem Brazos. Granbury Reservoir, located approximately 258 km (160 miles(m)) downstream from Possum Kingdom, and Whitney Reservoir, located approximately 92 km (57 mi) downstream from Granbury, have altered the habitat within the Middle and Lower Brazos River, which is most likely no longer suitable for the sharpnose shiner.

Reservoir construction on rivers also affects instream habitat and biotic communities upstream of the impoundment, which may include the extirpation of obligate riverine fish (e.g., et al., Winston, 1991). Ecological imbalances can occur when facultative riverine fish propagate in reservoirs and disperse into upstream reaches (Winston et al., 1991). Impoundments also present a barrier, preventing upstream migration and/or dispersal, and may cause local extirpations in upstream areas (i.e., headwaters) subject to drought or other natural disturbances (Wilde and Ostrand, 1999).

A study of the effects of the recently constructed Alan Henry Reservoir on the Double Mountain Fork of the Brazos River (Garza County) on prairie stream fish was performed by Wilde and Ostrand (1999). This segment of the Double Mountain Fork is in a semi-arid region (precipitation 46-71 cm/yr) where flow is intermittent and dependent on rain events. During the absence of flow, the stream is characterized by isolated pools that provide the only habitat for fish until the next rain event, which may not occur for several months. Following the impoundment of the river, the upstream reach showed a dramatic change in the fish assemblage, including a decrease in cyprinids and increase in abundance of cyprinodontids (Wilde and Ostrand, 1999). This study indicated that at least two fish species have, or will be, extirpated from the upstream reach. The disappearance of the fish is attributed to the lack of reproduction and/or survivorship occurring in isolated pools combined with the inability of the downstream population to recolonize the area due to the barrier created by the impoundment.

Future Reservoir Development

As required by Senate Bill 1 (enacted by the 75$^{th}$ Texas Legislature in 1997), Water Planning Regions within the State of Texas have developed and finalized Regional Water Plans for the purpose of addressing future water needs. The Regional Water Plans are to be incorporated into an overall State Water Plan addressing water management, development, and conservation for the 50-year period from 2000 to 2050.

The majority of the Brazos River Basin falls within the Regions G (Brazos) and O (Llano Estacado) Water Planning Areas. Among the water management strategies detailed in the Region G Water Plan six potential major reservoirs are included as feasible for providing water supply for the region. The potential major reservoirs listed in the plan are as follows:

- Breckenridge Reservoir (= Reynolds Bend), would be located in Throckmorton County and impound the Clear Fork of the Brazos River just downstream from the confluence with Paint Creek and is anticipated to store 600,000 acre feet of water;

- South Bend Reservoir, would be located in Young County immediately upstream from the confluence of the main stem and the Clear Fork of the Brazos River, capturing flow from

both channels, and storing up to 745,800 acre feet of water;

- Paluxy Reservoir in Somervell County, would impound the Paluxy River, a tributary of the Brazos, and store 99,700 acre-feet of water;

- Bosque Reservoir, would be located in Bosque County on the North Bosque River, a tributary of the Brazos, approximately 6.4 km (4 mi) upstream from the City of Meridian and would store 102,900 acre-feet of water;

- Millican Reservoir, which was originally authorized by the U. S. Congress in 1968 and has subsequently been studied for feasibility at two sites on the Navasota River; the Panther Creek site located approximately 21 km (13 mi) southeast of the City of Bryan (Brazos, Madison, and Grimes Counties) would store 1,973,000 acre-feet of water, and the Bundic Dam site, located between SH 21 and US 79 (Brazos, Robertson, Madison, and Leon Counties) would store 228,000 acre-feet of water;

- and Little River Reservoir, would be located in Milam County on the Little River just upstream from the confluence with the Brazos River and would store between 180,000 and 903,000 acre-feet of water.

In addition to these major reservoirs, the Region G Water Plan lists three minor reservoirs (estimated firm yields from 100 to 1,000 acre-feet/year) that would impound tributaries within the Brazos River Basin for water supply needs for the Cities of Throckmorton, Woodson, and Cisco.

Included in the Region G Water Plan are five off-channel reservoirs for water supply projects. An off-channel reservoir would divert water from a primary stream during high flows to a reservoir for storage. The off-channel reservoirs are Meridian, Somervell, Groesbeck, Little River, and Peach Creek. Of these reservoirs, Meridian and Somervell are alternatives considered for the Bosque and Paluxy Reservoirs, respectively. The water rights for Groesbeck Reservoir have been obtained and authorize the diversion of 2,500 acre-feet of water per year from the Navasota River in Limestone County. Peach Creek Reservoir would serve Brazos County by the impoundment of Peach Creek and water diversion from the Navasota River for the storage of 14,511 acre-feet. The newly proposed Little River Off-Channel Reservoir would be constructed on Beaver Creek, a tributary of the Little River, and store 202,500 acre-feet of water.

The water management strategies for the Region O Planning Area include the construction of Post Reservoir on the North Fork Double Mountain Fork of the Brazos River in Garza County. Post Reservoir has been authorized by the TNRCC, with a permit expiration date in 2008, and would impound 57,420 acre-feet of water.

An additional reservoir, not included in the Regional Water Plans, is under consideration by Knox, Nolan, Fisher, Stonewall, Haskell, and Kent Counties for future water supply. The proposed Double Mountain Fork Reservoir is in the initial stages of planning with potential dam sites located on the Double Mountain Fork upstream from the confluence with the Salt Fork in

Stonewall County (Freese and Nichols, 2001).

The historical habitat within the Middle and Lower Brazos River has effectively been converted from habitat that once supported the sharpnose shiner to habitat comprised of thermal, physical, and morphological parameters no longer suitable to the shiner, largely resulting from impoundments within the basin. Although current records of the fish from the main stem downstream of Possum Kingdom Reservoir are sparse, remnant populations may still exist in areas of suitable habitat. However, the suitable habitat remaining may be fragmented to the extent that any surviving populations are no longer viable. The continued effects of the existing impoundments coupled with the potential future water management strategies outlined in the Regional Water Plans seriously discount the possibility of recovery of the shiner in the Middle and Lower Brazos River.

Within the Upper Brazos River system, sharpnose shiners are most common within the higher order streams (Ostrand, 2000) with suitable flow and conductivity. The flow within the headwater reaches of the Double Mountain and Salt Forks is intermittent and often restricted to large pools within the channel. Under the harsh conditions that accompany non-flow periods, sharpnose shiners are the first species to be eliminated within the pools (Ostrand and Wilde, 2001).

The isolated pools of the Upper Brazos tributaries are unlikely suitable for successful reproduction of the sharpnose shiner. Its persistence in these upper reaches is most likely the result of recolonization from populations occurring downstream during times of normal flow (Wilde and Ostrand, 1999; Ostrand and Wilde, 2001). However, the headwaters may be significant to the reproductive success of the shiner. Reproduction may be triggered by flood events, allowing shiners to move into the headwaters where eggs would be released and transported by currents downstream to perennial areas (Wilde, pers. comm.). Reservoir construction on the Upper Brazos tributaries would create a barrier between the base population and the upper reaches, preventing recolonization and potentially reducing reproductive success.

The potential Double Mountain Fork and Post Reservoir projects could have significant adverse effects on the stable population of sharpnose shiners within the Upper Brazos. The construction of the John T. Montford Dam, which impounds Alan Henry Reservoir (Garza County), in 1991 resulted in the disappearance of two common fishes within the river's headwaters (Wilde and Ostrand, 1999). A similar situation could occur on the Double Mountain Fork downstream of Alan Henry Reservoir and the North Fork Double Mountain Fork, should the Double Mountain Fork and Post Reservoir projects be implemented. The potential direct impacts to the shiner resulting from construction of these reservoirs include 1) the inundation of occupied habitat, 2) the local extinction of upstream populations, and 3) the loss of habitat downstream from the dams due to the modification of necessary abiotic components (flow regime, thermal regime, substrate, conductivity, etc.).

Chloride Control Reservoirs

The streams of the Upper Brazos River Basin are characterized by natural salts that originate

within the salt and gypsum terrain and an underlying brine aquifer within this region. Because the salt entering the Brazos River in this area limits its use as a practical water supply, several studies on the feasibility of salt control have been conducted (e.g., Johnson et al., 1982).

Options within the Region G Water Plan for the control of naturally occurring chlorides include deep well injection of recovered brine from the aquifer and the construction of Kiowa Peak Reservoir for the disposal of recovered brine. The Kiowa Peak Reservoir would be located on North Croton Creek just upstream from the confluence with the main stem Brazos (Stonewall and King Counties) and have a storage capacity of 659,650 acre-feet. The original design and study on Kiowa Peak was done by the U.S. Army Corps of Engineers and included the two additional salt retention reservoirs; Dove, located on Haystack Creek (Stonewall and King Counties), and Croton, located on Croton Creek in Stonewall and Kent Counties (Johnson et al., 1982).

The sharpnose shiner evolved to prosper in the saline and turbid conditions naturally occurring in the Brazos River. The various chloride control projects proposed for the Upper Brazos for the conversion of the natural saline waters to a quality available for human consumption would modify the chemical characteristics conducive to sharpnose shiner habitat. Additionally, those projects that require the construction of brine retention reservoirs may also inundate shiner habitat and reduce instream flows to the major tributaries (i.e., the Salt Fork), as well as the Brazos River proper.

Existing Reservoir Enhancement

An alternative to water management within the Brazos River Basin is expanding the available yield in an existing reservoir by increasing the conservation pool level, water diversion to temporary storage, and construction of a new embankment downstream from the current one. Within the Brazos River Basin, Region G projects related to existing reservoir supply include increasing the storage of Leon Reservoir (conservation pool raise) in Eastland County, water diversion from California Creek into Stamford Reservoir (Haskell County), water diversion from Sweetwater Creek into Sweetwater Reservoir (Nolan County), water diversion from Battle Creek into Cisco Reservoir (Eastland County), and increasing the storage in Fort Phantom Hill Reservoir (new downstream embankment) in Jones County. These projects would contribute to the documented effects impoundments cause to river systems, especially regarding flow regime, within the existing range of the sharpnose shiner.

Discharges and Sedimentation

In 1996, 329 domestic facilities (i.e., municipal wastewater) and 172 industrial facilities held permits by the state (TNRCC, 1996) within the Brazos River Basin. Permits held by domestic and industrial facilities allow for the discharge of treated and untreated effluent into the basin. Within the Upper Brazos River drainage alone, the sum of permitted facility discharges is more than 6,670 million gallons of effluent per day (U.S. Fish and Wildlife Service, unpublished data). These discharges modify water quality and add to the continued alteration of the Brazos River

channel, affecting its morphology and substrate composition. Adverse conditions within the channel, such as low dissolved oxygen, causing fish kills result from these discharges when sewage facilities fail.

Sediment entering streams via stormwater runoff is the primary source of impairment to surface waters in the United States (Zweig, 2000). The predominant land use within the Brazos River Basin is agriculture. Practices that accompany agricultural operations, including harvesting, tilling, and native vegetation clearing contribute to sediment entering the Brazos River system and the conversion of the natural substrate to silt and mud bottom. This source, along with other development projects involving significant earth disturbance resulting in excessive sedimentation within the Brazos River, reduces the available habitat for the sharpnose shiner.

In 1996, 282 agricultural facilities (i.e., confined animal feeding operations (CAFOs)) were permitted by the state (TNRCC, 1996) within the Brazos River Basin. The wastes associated with CAFOs are typically high in nutrients (i.e., nitrogen and phosphorus compounds) and historically discharges of these wastes to surface water bodies have resulted in degraded water quality and wildlife mortality (Baker et al., 1998). CAFOs are not permitted to discharge into Waters of the United States except during severe weather events that exceed in intensity a 25-year rainfall event in a 24-hour period. In addition, during periods of intense rainfall and high flooding, retention structures can fail and lead to severe pollution to water bodies that results in fish kills due to the inability of the watershed to filter or dilute the heavy nutrient load. Although discharge from CAFOs is not allowed by permit under normal conditions, unlawful discharge does occur. For example, from 1993 to 1998, the Environmental Protection Agency (EPA), under the Clean Water Act, documented 24 discharges from permitted CAFOs into Waters of the United States in Texas. Thirteen of these discharges were caused by chronic storm events and reported to the EPA, the remaining eleven were illegal discharges.

From 1992 to 1999, the Texas Parks and Wildlife Department investigated over 60 fish kills attributable to anthropogenic causes (sewage discharge, oil spills, fertilizers, pesticides, etc.) and resulting in approximately 1,100,000 mortalities within the Brazos River Basin (Texas Parks and Wildlife, 2002).

B. Overutilization for commercial, recreational, scientific, or educational purposes.

There is no current information that would suggest sharpnose shiners are over utilized for commercial, recreational, scientific, or educational purposes. Minnows of the genus *Notropis* are undoubtedly used as bait fishes and are probably harvested in the commercial bait industry. Commercial bait harvesters are required to obtain a permit and report annually on the species and numbers collected. However, the permit does not restrict the quantity of nongame fishes that can be harvested, and furthermore, the list of nongame fishes allowed for harvest under the permit specifies "*Notropis spp*.," which is likely the most detail submitted in an annual report. Currently, four permits have been issued for the harvest and sale of minnows from the Brazos River. Only two permittees reported a harvest in 2001. The impacts the bait industry may have on the sharpnose shiner are unknown.

C. Disease or predation.

The impact of disease or predation upon the sharpnose shiner is not known. The State introduces game fish within the Brazos River and its impoundments, including some exotic species, which likely prey upon sharpnose shiners. However, the extent of the effects of predation has not been determined.

D. The inadequacy of existing regulatory mechanisms.

State law does not provide protection for the sharpnose shiner. There are no regulatory mechanisms for persons harvesting these minnows for use as bait fish, with the exception of a State fishing license and Nongame Fish Permit. Permitted individuals are not restricted in quantity for bait fish harvests. See also discussion under A. above.

E. Other natural or manmade factors affecting its continued existence.

In recent years, the Brazos River has experienced massive blooms of golden algae (*Prymnesium parvum*) resulting in several fish kills. The alga kills by way of toxins released into the water that have a lethal effect on gill-breathing animals. Although little is known about the causes of golden algal blooms, as with many other algae, they may be triggered by excessive nutrient loading from point source and non-point source events such as industrial and municipal discharges and runoff from agricultural operations. The effects of the golden algae may be insignificant, but further information is necessary.

Within the Lower Brazos River, sand and gravel operations have mined the channel for many years (Dunn and Raines, 2001). The significance of the effects of these operations to the sharpnose shiner is not known. The current limited distribution of the sharpnose shiner within the Upper Brazos River Basin makes it vulnerable to catastrophic events occurring in this region. The shiner maintains populations within the harsh conditions of this area and can recover from droughts, provided the conditions of its habitat remain suitable. Catastrophic events such as the introduction of competitive species or prolonged drought would increase the likelihood of extinction.

The potential for introduction of competitive species is high due to the reports of such unintentional introductions by anglers and commercial bait fishermen. For example, the Red River shiner (*N. bairdi*) was apparently introduced into the range of the threatened Arkansas River shiner, and may seriously threaten its status. The Red River shiner is currently not known from the Brazos River, however, the probability of introduction is high, since the Red River Basin is immediately to the north of the current population of sharpnose shiners. Currently, there is no evidence that introduced species within the Brazos River effectively compete with the sharpnose shiner.

BRIEF SUMMARY OF REASONS FOR REMOVAL OR LISTING PRIORITY CHANGE:
N/A

FOR RECYCLED PETITIONS: N/A

a. Is listing still warranted? ___

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? ___

c. Is a proposal to list the species as threatened or endangered in preparation? ___

d. If the answer to c. above is no, provide an explanation of why the action is still precluded.

LAND OWNERSHIP (Estimate proportion Federal/state/local government/private, identify non-private owners):

The sharpnose shiner occurs in rivers and streams that are owned by the State of Texas. The majority of the riparian land ownership within the documented range of the shiner is private, with minor areas owned by the State (Parks), and Federal (Corps of Engineers) governments.

PRELISTING (Describe status of conservation agreements or other conservation activities): None

REFERENCES (Identify primary sources of information (e.g., status reports, petitions, journal publications, unpublished data from species experts) using formal citation format):

Anderson, A. A., C. Hubbs, K. O. Winemiller, and R. J. Edwards. 1995. Texas freshwater fish assemblages following three decades of environmental change. Southwest. Nat. 40(3):314-321.

Anderson, K. A., T. L. Beitinger, and E. G. Zimmerman. 1983. Forage fish assemblages in the Brazos River upstream and downstream from Possum Kingdom Reservoir. Texas. J. Freshwater Ecol., 2:81-88.

Armstrong, M. A. 1998. A fishery survey of the middle Brazos River basin in north-central Texas. U.S. Fish and Wildlife Service, Region 2, 72 pp.

Bain, M. B., J. T. Finn, and H. E. Booke. 1988. Streamflow regulation and fish community structure. Ecology, 69(2):382-392.

Baker, D. L., J. D. Lusk, and C. M. Giggleman. 1998. Phase II Contaminants Investigation of Buffalo Lake National Wildlife Refuge, Texas 1993-1994. U.S. Fish and Wildlife Service, Arlington, Texas, 35 pp.

Brazos G Regional Water Planning Group. 2001. Brazos G Regional Water Planning Area, Regional Water Plan. Prepared by HDR Engineering, Inc. for the Texas Water Development Board.

Cronin, J. G., C. R. Follett, G. H. Shafer, and P. L. Rettman. 1973. Reconnaissance

investigation of the ground-water resources of the Brazos River Basin, Texas. Texas Water Commission Bulletin 6310, 152 pp.

Dunn, D. D. and T. H. Raines. 2001. Indications and potential sources of change in sand transport in the Brazos River, Texas. United States Geological Survey Water-Resources Investigations Report 01-4057, 32 pp.

Echelle, A. A., A. F. Echelle, and L. G. Hill. 1972. Interspecific interactions and limiting factors of abundance and distribution in the Red River pupfish, *Cyprinodon rubrofluviatilis*. Amer. Mid. Nat. 88:109-130.

Freese and Nichols. 2001. Aspermont Economic Development Corporation analysis of potential dam sites in Stonewall County. Draft Memorandum Report, 64 pp.

Gilbert, C. R. 1980. *Notropis oxyrhynchus* Hubbs and Bonham, sharpnose shiner. p. 291 in D.S. Lee et. al. *Atlas of North American Freshwater Fishes*. N. C. State Mus. Nat. Hist., Raleigh, *i-x* + 854 pp.

Gore, J. A. and R. M. Bryant. 1986. Changes in fish and benthic macroinvertebrate assemblages along the impounded Arkansas River. J. Freshwater Ecol., 3(3):333-345.

Hubbs, C. L. and K. Bonham. 1951. New cyprinid fishes of the genus *Notropis* from Texas. Tex. J. Sci., 3(1):91-110.

Hubbs, C. L., R. J. Edwards, and G. P. Garrett. 1991. An annotated checklist of the freshwater fishes of Texas, with keys to identification of species. Tex. J. Sci. 43(4) Supplement, 56 pp.

Hubbs, C. L., E. Marsh-Matthews, W. J. Matthews, and A. A. Anderson. 1997. Changes in fish assemblages in east Texas streams from 1953 to 1986. Tex. J. Sci. 49(3) Supplement:67-84.

Johnson, J. L., R. H. Wiley, R. DeArment, B. Spain, and B. Alexander. 1982. Brazos Natural Salt Pollution Control Project, Texas. U. S. Department of the Interior, Fish and Wildlife Service, Region 2, Area 1, Austin, Texas, 41 pp.

Llano Estacado Water Planning Group. 2001. Llano Estacado Water Planning Area Regional Water Plan. Prepared by HDR Engineering, Inc. for the Texas Water Development Board.

Marks, D. E., G. R. Wilde, K. G. Ostrand, and P. J. Zwank. 2001. Foods of the smalleye shiner and sharpnose shiner in the upper Brazos River, Texas. Tex. J. Sci., 53(4)327-334.

Mathewson, C. C. and L. L. Minter. 1981. Impact of water resource development on the

hydrology and sedimentology of the Brazos River, Texas with implications on shoreline erosion. Bull. Assoc. Eng. Geol.18(1):39-53.

Moore, G. A. 1944. Notes on the early life history of *Notropis girardi*. Copeia 4:209-214.

Moss, R. W. and K. B. Mayes. 1993. Current status of *Notropis buccula* and *Notropis oxyrhynchus* in Texas. River Studies Report 8, Texas Parks and Wildlife Department, Austin, 125 pp.

Ostrand, K. G. 2000. Abiotic determinants of fish assemblage structure in the upper Brazos River, Texas. Unpublished PhD dissertation, Texas Tech Univ., Lubbock, 101 pp.

Ostrand, K. G. and G. R. Wilde. 2001. Temperature, dissolved oxygen, and salinity tolerences of five prairie stream fishes and their role in explaining fish assemblages. Trans. Am. Fish. Soc., 130:742-749.

Texas Parks and Wildlife Department. 1996. Survey Report for the Brazos River, 1994. Statewide Freshwater Fisheries Monitoring and Management Program, Federal Aid in Sport Fish Restoration Act Project F-30-R, 38 pp.

Texas Parks and Wildlife Department. 2002. Pollution Response Inventory and Species Mortality (PRISM) Database. Compiled by Texas Parks and Wildlife Department Kills and Spills Team, Resource Protection Division, Austin, Texas.

Texas Natural Resource Conservation Commission. 1996. The state of Texas water quality inventory, 13th Edition, Volume 2, 711 pp.

U. S. Fish and Wildlife Service. 1994. An Ecosystem Approach to Fish and Wildlife Conservation: An Approach to More Effectively Conserve the Nation's Biodiversity, 14 pp.

Wilde, G. R. personal communication. Texas Tech University, Lubbock, Texas.

Wilde, G. R. and T. H. Bonner. Unpublished. Texas Tech University, Lubbock, Texas; Southwestern State University, San Marcos, Texas.

Wilde, G. R. and K. G. Ostrand. 1999. Changes in the fish assemblage of an intermittent prairie stream upstream from a Texas impoundment. Tex. J. Sci., 51(3): 203-210.

Winemiller, K. O. Unpublished. Texas A&M University, College Station, Texas.

Winemiller, K. O. and F. P. Gelwick. 1999. Assessment of ecological integrity of streams in the Brazos-Navasota River watershed based on biotic indicators. Final Project Report to the

Brazos River Authority, 32 pp.

Winston, M. R., C. M. Taylor, and J. Pigg. 1991. Upstream extirpation of four minnow species due to damming of a prairie stream. Trans. Am. Fish. Soc., 120:98-105.

Zweig, L. D. 2000. Effects of deposited sediment on stream benthic communities. Master of Science Thesis, University of Missouri-Columbia, 150 pp.

LISTING PRIORITY (place * after number)

| THREAT | | | |
|---|---|---|---|
| Magnitude | Immediacy | Taxonomy | Priority |
| High | Imminent | Monotypic genus | 1 |
| | | Species | 2 |
| | | Subspecies/population | 3 |
| | Non-imminent | Monotypic genus | 4 |
| | | Species | 5* |
| | | Subspecies/population | 6 |
| Moderate to Low | Imminent | Monotypic genus | 7 |
| | | Species | 8 |
| | | Subspecies/population | 9 |
| | Non-imminent | Monotypic genus | 10 |
| | | Species | 11 |
| | | Subspecies/population | 12 |

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all additions of species to the candidate list, removal of candidates, and listing priority changes.

Approve: Pat Langley April 25, 2002

Acting Regional Director, Fish and Wildlife Service Date

Concur: Steve Williams June 3, 2002
Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Director's Remarks: _____

_____

_____

Date of annual review: _____
Conducted by: _____

Comments: _____

_____

_____

(rev. 1/02)